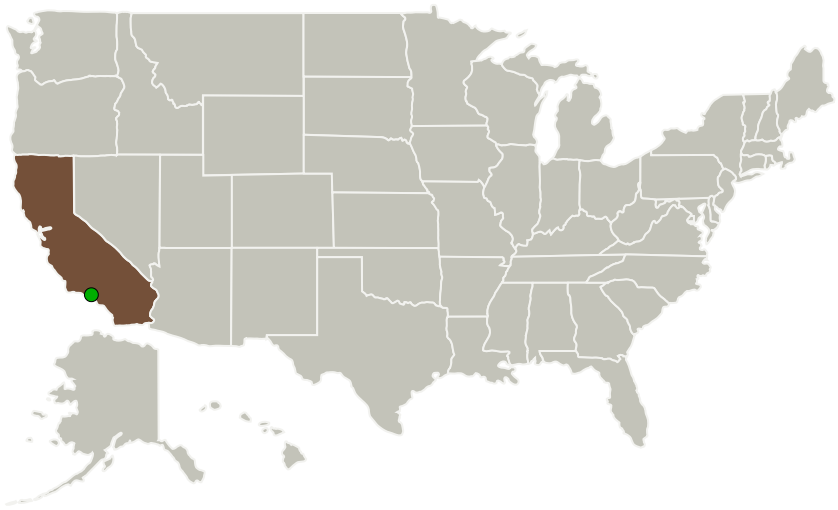
Miniaturized In Situ Atmospheric Probe Sampling Inlet System for Uranus or Saturn, Phase I

Completed Technology Project (2013 - 2013)

Project Introduction

Thorleaf Research, Inc. proposes to develop a miniaturized in situ atmospheric probe sampling inlet system for measuring chemical and isotopic composition of the atmospheres of the giant planets, with special emphasis on NASA needs for missions to Uranus and Saturn. Our innovative design will provide a constant flow rate of sample to the inlet of a mass spectrometer (MS) in spite of more than a hundred-fold variation in external atmospheric pressure, allowing the detection sensitivity of the MS to be optimized over the full descent profile of the atmospheric probe, unlike previous sampling systems that depended on fixed leaks. This addresses a key technology gap for planetary studies, mainly how to acquire and prepare samples for in situ analysis while meeting challenging mass, volume and power constraints. Based on our analysis, we project a system mass on the order of 0.5 kg and an average power consumption of <0.5 watt, depending on materials and the configuration selected. The goal of our proposed SBIR Phase I effort is to demonstrate feasibility for a miniaturized in situ atmospheric probe sampling inlet system for Uranus and Saturn, and to develop a detailed design for fabricating prototype instrumentation in Phase II.

Primary U.S. Work Locations and Key Partners



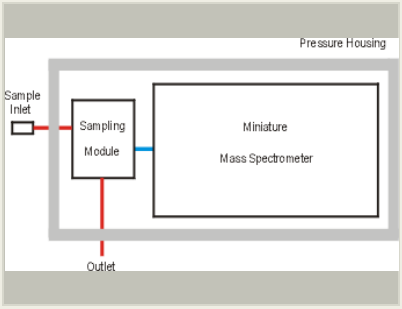


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Table of Contents

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Organizations Performing Work	Role	Type	Location
Thorleaf Research, Inc.	Lead Organization	Industry	Santa Barbara, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

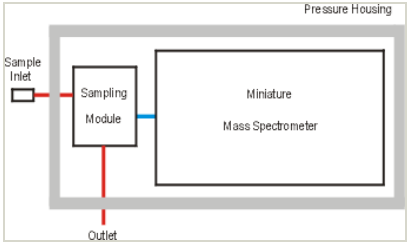
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138308)*

Images



Project Image
Miniaturized In Situ Atmospheric Probe Sampling Inlet System for Uranus or Saturn
(https://techport.nasa.gov/image/134854)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Thorleaf Research, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Paul Holland

Co-Investigator:
Paul G Holland

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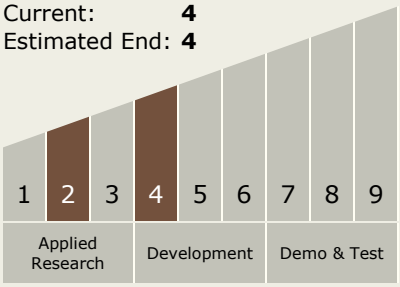
Completed Technology Project (2013 - 2013)

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.6 Cryogenic / Thermal

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System